What is claimed is:

1. A lithium battery separator having a shutdown function and comprising a porous carrier having a porous inorganic nonelectroconductive coating layer on and in said carrier, characterized in that a shutdown layer of shutdown particles which melt at a predetermined temperature and close the pores of said inorganic layer is present on said inorganic layer and bonded thereto.

2. A separator according to claim 1, characterized in that said carrier is flexible and less than 50 µm in thickness.

3. A separator according to claim 1 or 2, characterized in that said carrier comprises woven or non-woven polymeric or glass fibers.

4. A separator according to claim 3, characterized in that said carrier is a polymeric nonwoven.

5. A separator according to claim 3 or 4, characterized in that said polymeric fibers are selected from fibers of polyacrylonitrile, polyester and/or polyolefin.

6. A separator according to at least one of claims 1 to 5, characterized in that said carrier is less than 30 µm in thickness.

7. A separator according to any one of claims 1 to 6, characterized in that said porous inorganic coating layer present on said carrier comprises oxide particles of the elements Al, Si and/or Zr from 0.5 to 10 µm in size on average.

8. A separator according to at least one of claims 1 to 7, characterized in that said shutdown particles have an average size (D_w) which is greater than the average pore size (d) of said pores of said porous inorganic layer.

9. A separator according to at least one of claims 1 to 8, characterized in that the layer of

shutdown particles has a thickness (z_w) which is approximately in the range from said average size of said shutdown particles (D_w) up to 10 times said particle size D_w.

10. A separator according to at least one of claims 1 to 9, characterized in that said shutdown particles are selected from polymers, polymer blends, natural waxes or artificial waxes.

11. A process for producing a separator having a shutdown function, which comprises particles having a defined, desired melting temperature being applied to and fixed on a porous inorganic layer of a separator.

12. A process according to claim 11 for producing a separator as claimed in at least one of claims 1 to 12.

13. A process according to claim 11 or 12, further comprising said porous inorganic layer being hydrophobicized before said shutdown particles are applied to it.

14. A process according to any one of claims 11 to 13, further comprising said porous inorganic layer being treated with an adhesion promoter before said shutdown particles are applied to it.

15. A process according to claim 14, further comprising said porous inorganic layer being produced by using a polymeric sol comprising a silane adhesion promoter for said shutdown particles to be applied later.

16. A process according to one of claims 11 to 15, further comprising said layer of shutdown particles being generated by applying a suspension of shutdown particles having an average size larger than the average pore size of the separator layer in a suspension medium selected from a sol, water or alcohols.

17. A process according to claim 16, wherein said suspension comprises an adhesion

promoter.

18. A process according to claim 17, further comprising selecting said adhesion promoter from hydrolyzed or nonhydrolyzed functionalized alkyltrialkoxysilanes.

19. A process according to any one of claims 16 to 18, further comprising said suspension being applied to said porous inorganic layer by printing on, pressing, pressing in, rolling on, knifecoating on, brushing on, dipping, squirting, spraying or pouring on.

20. A process according to at least one of claims 16 to 19, further comprising said layer being obtained by said applied suspension being dried at a temperature in the range from room temperature to 100°C.

21. A process according to at least one of claims 11 to 20, further comprising following application said particles being fixed on said porous inorganic layer by single heating to a temperature above the glass transition temperature to fuse on said particles without changing the actual shape.

22. A process according to at least one of claims 11 to 21, wherein said shutdown particles are selected from particles composed of polymers, polymer blends, natural waxes and/or artificial waxes.

23. A process according to claim 22, wherein said shutdown particles are particles composed of polyethylene wax.

24. The use of a separator as claimed in at least one of claims 1 to 10 as a separator in lithium batteries.

25. A battery comprising a separator as claimed in at least one of claims 1 to 10.